



**Mekong River Commission**

**Weekly Dry Season Situation Report in  
the Lower Mekong River Basin  
14-20 December 2021**

Prepared by  
The Regional Flood and Drought Management Centre  
21 December 2021

*The MRC is funded by contributions from its Member Countries and Development Partners, including Australia, Belgium, the European Union, Finland, France, Germany, Japan, Luxembourg, the Netherlands, Sweden, Switzerland, the United States and the World Bank.*

**Copyright © Mekong River Commission, 2020**

First published (2020)

Some rights reserved

This work is the product of the Mekong River Commission Secretariat. While all efforts are made to present accurate information, the Secretariat does not guarantee the accuracy of the data included in this work. The boundaries, colours, denomination, and other information shown on any map in this work do not imply any judgement on the part of the MRC concerning the legal status of any territory or the endorsement or acceptance of such boundaries.

Nothing herein shall constitute or be considered to be a limitation upon or waiver of the privileges and immunities of the MRC, all of which are specifically reserved.

This publication may be reproduced in whole or in part and in any form for educational or non-profit purposes without special permission from the copyright holder, provided acknowledgement of the source is made and notification is sent to the MRC. The MRC would appreciate receiving a copy of any publication that uses this publication as a source. This publication cannot be used for sale or for any other commercial purpose whatsoever without permission in writing from the MRC.

**Title:** Weekly wet season situation report in the Lower Mekong River Basin for 14-20 December 2021

ISSN: 1728-3248

Keywords: flood/drought/weather/Mekong/Tonle Sap

For bibliographic purposes, this volume may be cited as:

Mekong River Commission. (2020). *Weekly dry season situation report in the Lower Mekong River Basin for 14-20 December 2021*. Vientiane: MRC Secretariat.

Information on MRC publications and digital products can be found at  
<http://www.mrcmekong.org/publications/>

**All queries on rights and licenses should be addressed to:**

Mekong River Commission

Documentation and Learning Centre

184 Fa Ngoum Road, Unit 18, Ban Sithane Neua, Sikhottabong District, Vientiane 01000, Lao PDR

Telephone: +856-21 263 263 | E-mail: [mrcs@mrcmekong.org](mailto:mrcs@mrcmekong.org) | [www.mrcmekong.org](http://www.mrcmekong.org)

# Contents

- Figures..... ii
- Table ..... iii
- Key Messages .....iv
- 1 Introduction ..... 1**
- 2 General Weather Patterns..... 2**
- 3 Water Levels in the Lower Mekong River ..... 6**
- 4 Flash Flood in the Lower Mekong Basin ..... 13**
- 5 Drought Monitoring in the Lower Mekong Basin..... 14**
- 6 Weather and Water Level Forecast and Flash Flood Information..... 17**
  - 6.1 Weather and rainfall forecast..... 17*
  - 6.2 Water level forecast ..... 18*
  - 6.3 Flash Flood Information..... 19*
  - 6.4 Drought forecast..... 20*
- 7 Summary and Possible Implications ..... 22**
  - 7.1 Rainfall and its forecast..... 22*
  - 7.2 Water level and its forecast..... 22*
  - 7.3 Flash flood and its trends..... 23*
  - 7.4 Drought condition and its forecast..... 23*

## Figures

<b>Figure 1: Summary of weather conditions over the LMB. ....</b>	<b>2</b>
<b>Figure 2: Outlook of wet and dry conditions over the Asian countries by ASMC.....</b>	<b>3</b>
<b>Figure 3: No tropical storm risk observed on 20 December. ....</b>	<b>3</b>
<b>Figure 4: Weekly total rainfall at key stations in the LMB.....</b>	<b>4</b>
<b>Figure 5: Weekly rainfall distribution over the LMB.....</b>	<b>5</b>
<b>Figure 6: Key stations and model application for River Monitoring and Flood Forecasting. .</b>	<b>6</b>
<b>Figure 7. Water level at the Jinghong hydrological station during 15 Oct to 20 Dec 2021. ...</b>	<b>7</b>
<b>Figure 8. Water levels at Chiang Saen in Thailand and Luang Prabang in Lao PDR. ....</b>	<b>8</b>
<b>Figure 9. Water levels Veintiane and Paksane in Lao PDR.....</b>	<b>9</b>
<b>Figure 10: Water levels at Nakhon Phanom and Savannakhet of Thailand and Lao PDR. ....</b>	<b>9</b>
<b>Figure 11: Water levels at Stung Treng and Kratie on the Mekong River. ....</b>	<b>10</b>
<b>Figure 12: Seasonal change of inflows and outflows of Tonle Sap Lake. ....</b>	<b>11</b>
<b>Figure 13. The seasonal change in monthly flow volume of Tonle Sap Lake.....</b>	<b>12</b>
<b>Figure 14: Weekly standardised precipitation index from Dec 4 to 10.....</b>	<b>14</b>
<b>Figure 15: Weekly Index of Soil Water Fraction from Dec 4 to 10.....</b>	<b>15</b>
<b>Figure 16: Weekly Combined Drought Index during Dec 4 to 10. ....</b>	<b>16</b>
<b>Figure 17: Accumulated rainfall forecast (24 hrs) of model GFS. ....</b>	<b>18</b>
<b>Figure 185. Daily average of monthly rainfall anomaly forecast from December 2021 to February 2022.....</b>	<b>20</b>

## Table

<b>Table 1. The monthly change in the flow volume of Tonle Sap Lake. ....</b>	<b>12</b>
<b>Table 2. Weekly River Monitoring Bulletin. ....</b>	<b>21</b>

## Key Messages

Key messages for this weekly report are presented below.

### **Rainfall and its forecast**

- During December 14-20, low rainfall observed over the lower part of the Mekong region at Tan Chau and Chau Doc, varied from 2.20 millimetres (mm) to 13.00 mm.
- There will be some rainfalls for the next 7 days over the Mekong region from 21 to 27 Dec 2021 since there is a low-pressure line dominating the Mekong region.

### **Water level and its forecast**

- The MRC's observed water level at Jinghong showed a decrease of about 0.19 m from 535.45 m on 14 Dec to 535.26 m on 20 Dec 2021 (recorded on 7:00 am), and it was about 1.27 m lower than its two-year average (2020-2021) value. The outflow was down from 952.15 m<sup>3</sup>/s on 14 Dec to 826.59 m<sup>3</sup>/s on 20 Dec 2021.
- Along with the slightly decreased outflow from Jinghong upstream, water levels of monitoring stations at Chiang Saen in Thailand also decreased about 0.54 m from 14 to 20 Dec 2021. However, water levels from Chiang Khan in Thailand to Paksane in Lao PDR slightly increased about 0.25 m from 14 to 20 Dec 2021 due to less rainfall in the area and influence of dam operation. Water levels from Nakhon Phanom in Thailand to Pakse in Lao PDR were decreasing about 0.10 m. Water levels from the stretches of the river from Stung Treng to Kratie and at Kompong Cham in Cambodia, moreover, were decreasing due to less contributed rainfall from the upstream part (at Pakse and 3S area in Viet Nam).
- The water volume of the Tonle Sap Lake in 2021 was lower than its LTA but higher than the levels in 2019 and 2020 during the same period from 14 to 20 December 2021, and still considered critical.
- Over the next seven days, the water levels across most monitoring stations are expected to go down and remain lower than their long-term average value in most stations.

### **Drought condition and its forecast**

- Drought condition of the LMB from December 11 to 17 was normal all over the LMB except some moderate drought in north-eastern part due to severely dry soil moistures during the beginning of dry season. The region showed no significant threat except some moderate and severe dry soil moistures in the upper and middle parts of the LMB.
- For the upcoming three-month forecast, the LMB is likely to receive from average to above average rainfall from December 2021 to February 2022. There will be some more rain dropping over the southern part of the LMB during December 2021-February 2022 making the condition cooler than normal year, while normal condition is taking place in the upper and middle parts of the region during the last month of the year.

# 1 Introduction

This Weekly Dry Season Situation Report presents a preliminary analysis of the weekly hydrological situation in the Lower Mekong River Basin (LMB) for **14-20 December 2021**. The trend and outlook for water levels are also presented.

This analysis is based on the daily hydro-meteorological data provided by the Mekong River Commission (MRC) Member Countries – Cambodia, Lao PDR, Thailand, and Viet Nam – and on satellite data. Water level indicated in this report refers to an above zero gauge of each station.

The report covers the following topics that are updated weekly:

- General weather patterns, including rainfall patterns over the LMB
- Water levels in the LMB, including in the Tonle Sap
- Flash flood and drought situation in the LMB
- Weather, water level and flash flood forecast, and
- Possible implications.

Mekong River water levels are updated daily and can be accessed from:  
[http://ffw.mrcmekong.org/bulletin\\_wet.php](http://ffw.mrcmekong.org/bulletin_wet.php).

Drought monitoring and forecasting information is available at:  
<http://droughtforecast.mrcmekong.org>

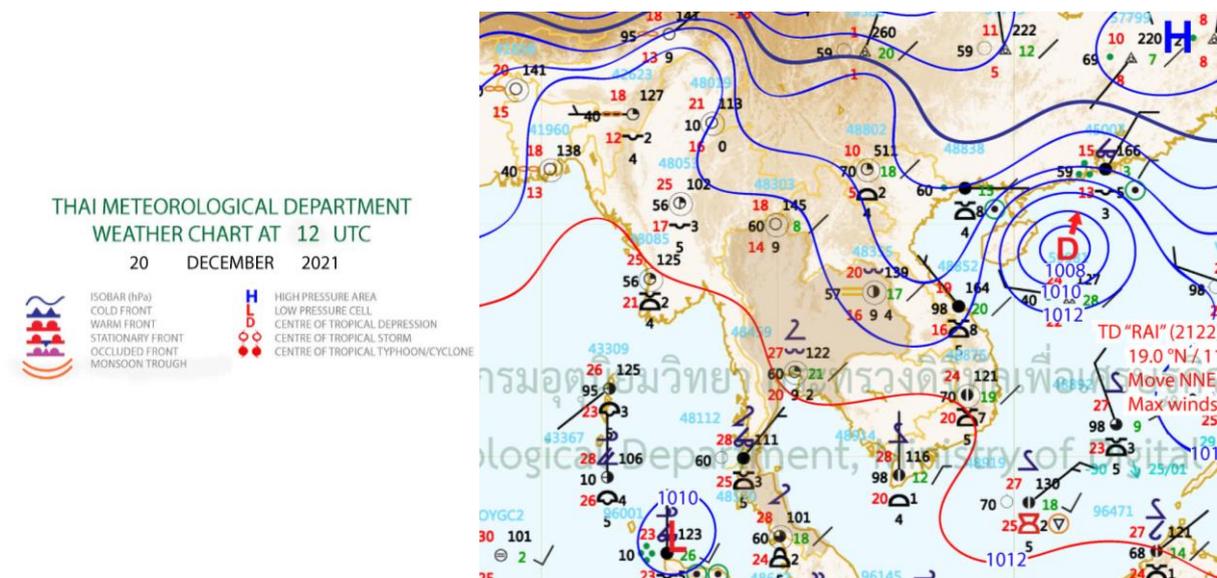
Flash flood information is accessible at: <http://ffw.mrcmekong.org/ffg.php>

## 2 General Weather Patterns

The weather outlook bulletins for three months (December, January, and February) and the weather maps issued by the Thai Meteorological Department (TMD) were used to verify weather conditions in the LMB.

Since the beginning of December 2021, rainfall has been significantly reduced in the LMB, with gradually decreasing water levels in both mainstream and tributaries. The data from the TMD predict that low pressure of air-mass will bring cool weather condition in the upper part of Thailand, Lao PDR and Viet Nam. As a result, the temperature in the upper part of Thailand will drop sharply as commonly chilly weather, specifically at the upper portion of the northern and north-eastern parts together with very cold weather in mountainous areas (within the Mekong region).

[Figure 1](#) presents the weather map of 20 December 2021, showing a line of low pressure of the Monsoon Trough crossing the upper Mekong region which can predicted of rainfall over the next few days.



**Figure 1: Summary of weather conditions over the LMB.**

According to the ASEAN Specialised Meteorological Centre (ASMC), a highest probability of warm conditions is predicted over of the lower part of the Mekong region covering Lao PDR and Thailand from 13 to 26 December 2021, during the 2<sup>nd</sup> and 3<sup>rd</sup> weeks of December. Moreover, LMB is likely dominated by warmer condition, which may receive cool temperature in general in the Lower part to the LMB. **Figure 2** shows the outlook of weather condition from 13 to 26 December 2021 in Southeast Asia based on results from the NCEP model (National Centres for Environmental Prediction).

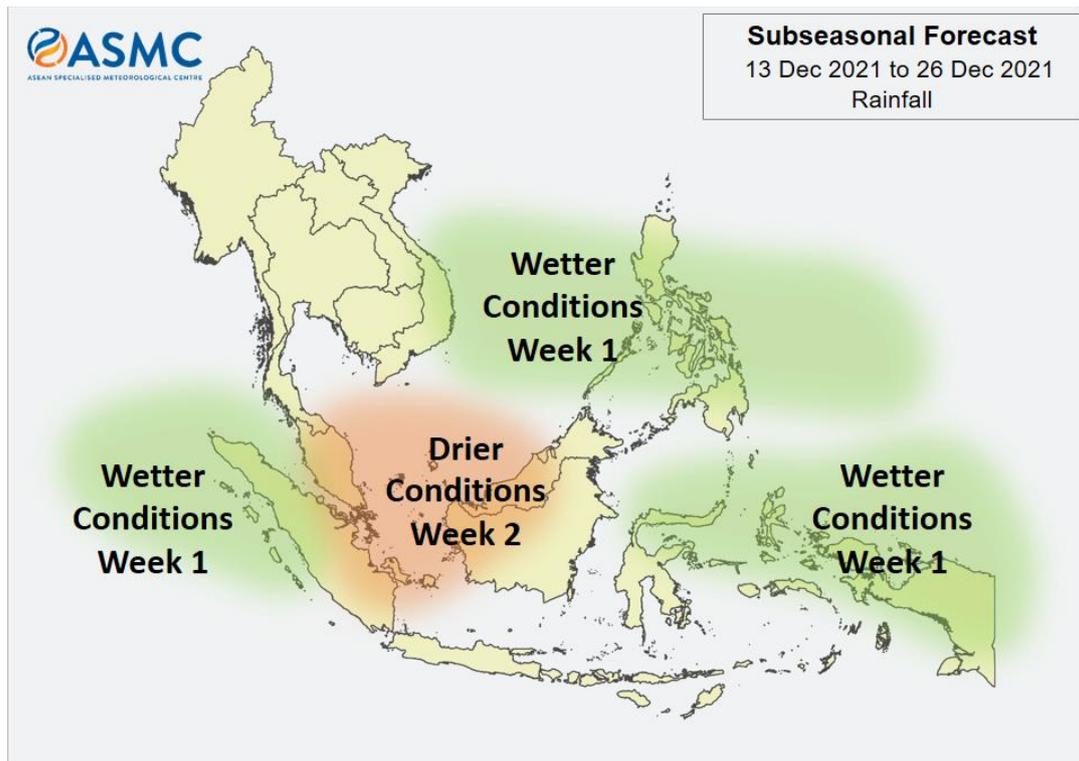


Figure 2: Outlook of wet and dry conditions over the Asian countries by ASMC.

**Tropical depressions (TD), tropical storms (TS) and typhoons (TY)**

There was a low-pressure line is still nominating the LMB during 14-20 Dec 2021. This had caused some rainfall in the LMB, including the Mekong Delta in Viet Nam and the 3S area (Sesan, Sre Pok, and Sekong) of Cambodia and Viet Nam. A storm movement of RAI moved close to Vietnam December 18 but seems to be returned head, as displayed in [Figure 3](#).

**Active system as of 20 December 2021 8:23 GMT**

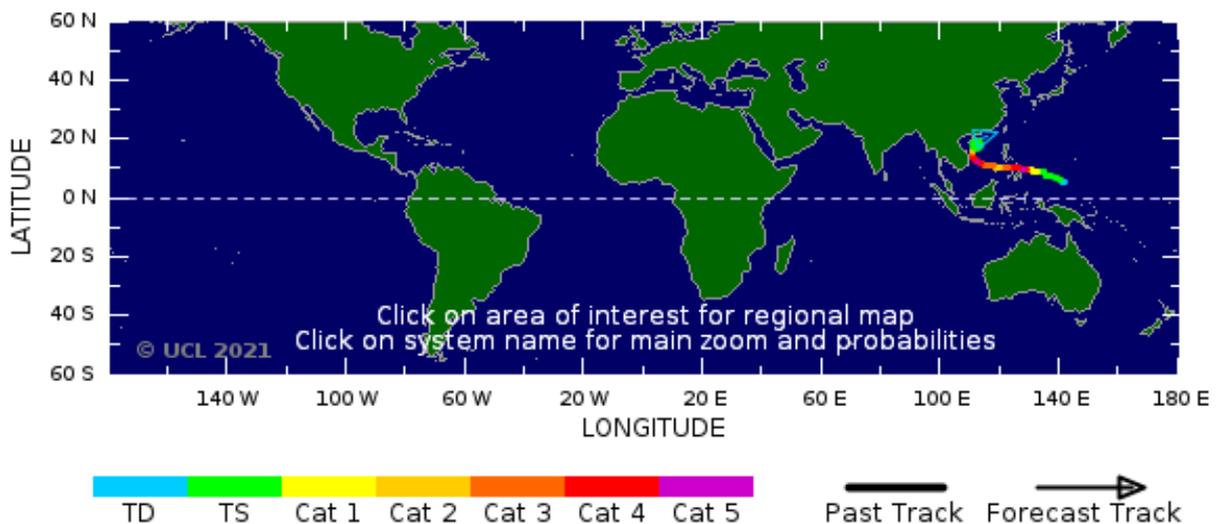
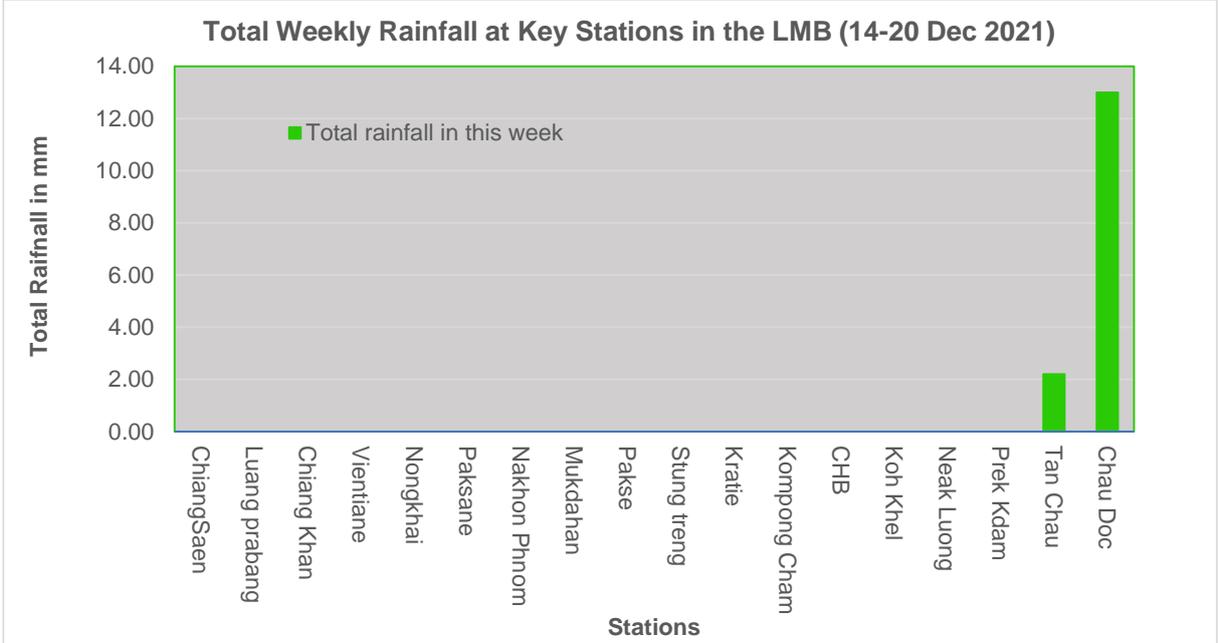


Figure 3: No tropical storm risk observed on 20 December.

**Rainfall patterns over the LMB**

This week, low rainfall observed over the lower part of the Mekong region at Tan Chau and Chau Doc, varied from 2.20 mm to 13.00 mm. The rainfall from 14 to 20 December is showed in [Figure 4](#).



**Figure 4: Weekly total rainfall at key stations in the LMB.**

To verify area rainfall distribution, [Figure 5](#) shows a map of the weekly accumulated rainfall based on observed data provided by the MRC Member Countries – Cambodia, Lao PDR, Thailand, and Viet Nam – from 14 to 20 December 2021.

Absence of rain this week is an indication of the end of the rainy season in the LMB.

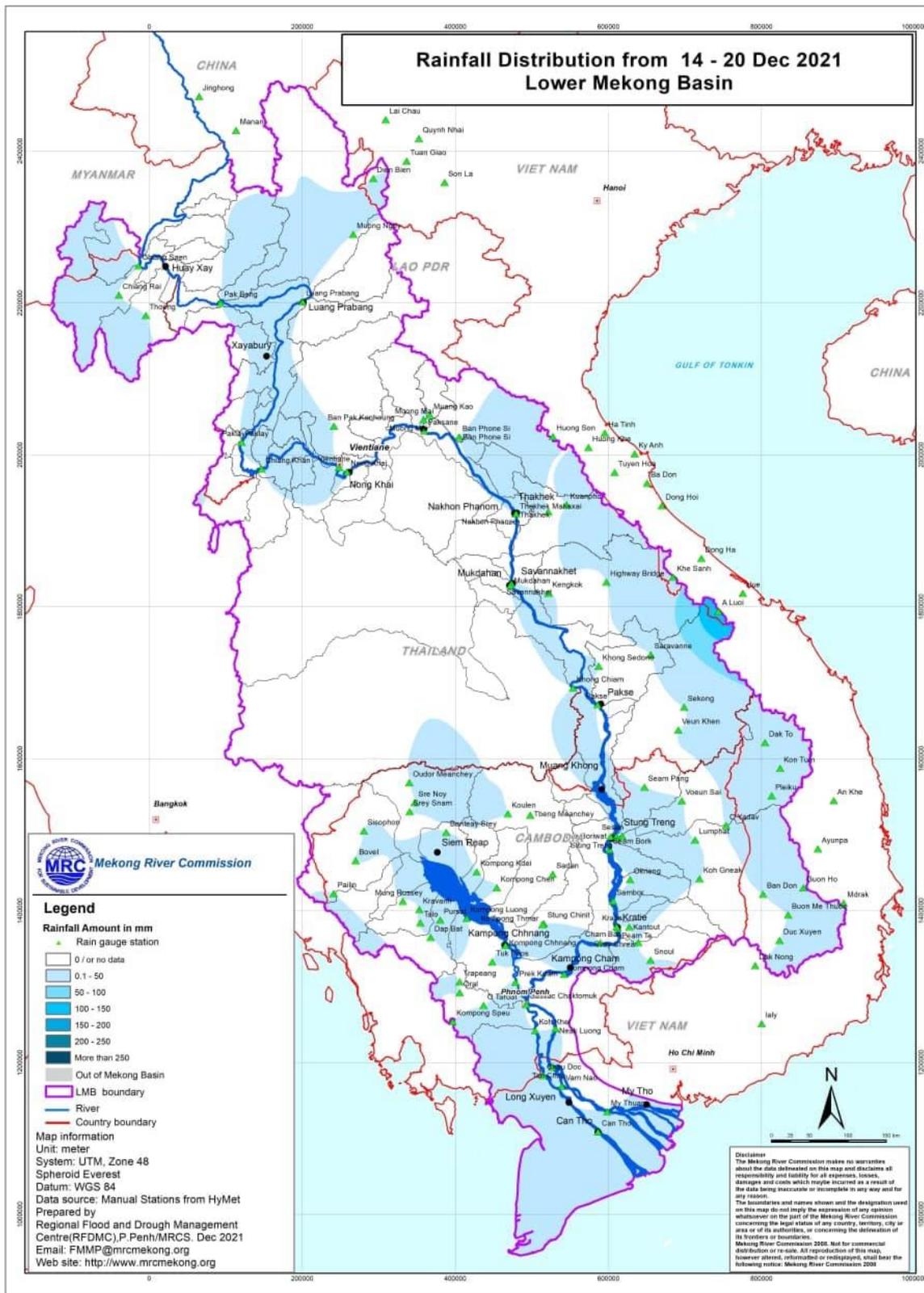


Figure 5: Weekly rainfall distribution over the LMB.

### 3 Water Levels in the Lower Mekong River

The hydrological regimes of the Mekong mainstream are illustrated by recorded water levels and flows at key mainstream stations: at Chiang Saen to capture mainstream flows entering from the Upper Mekong Basin (UMB); at Vientiane to present flows generated by climate conditions in the upper part of the LMB; at Pakse to investigate flows influenced by inflows from the larger Mekong tributaries; at Kratie in Cambodia to capture overall flows of the Mekong Basin; and at Viet Nam’s Tan Chau and Chau Doc to monitor flows to the Delta.

The key stations along the LMB and their respective model application for River Flood Forecasting during the wet season from June to October and River Monitoring during the dry season from November to May are presented in [Figure 6](#). The hydrograph for each key station is available from the MRC’s River Flood Forecasting: <http://ffw.mrcmekong.org/overview.php>. The weekly water levels and rainfall at each key station are summarised in **Annex A**.

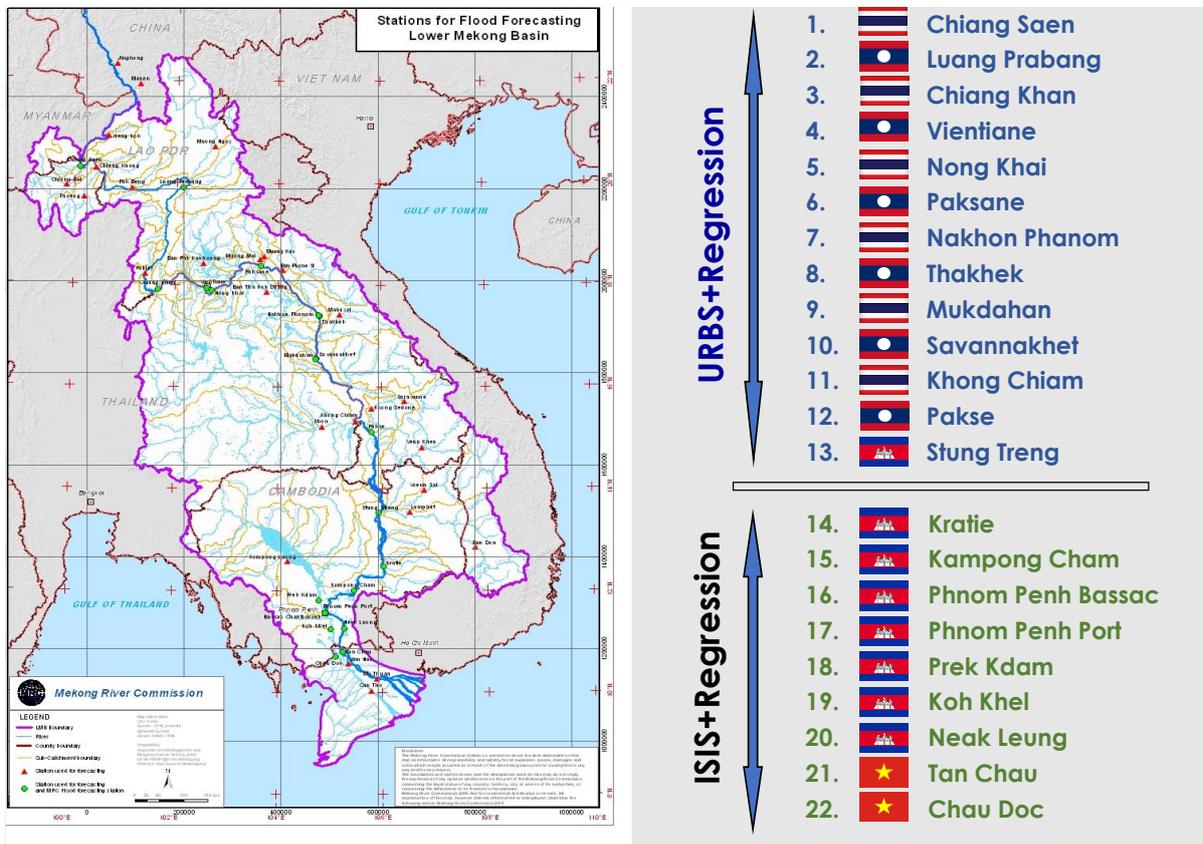
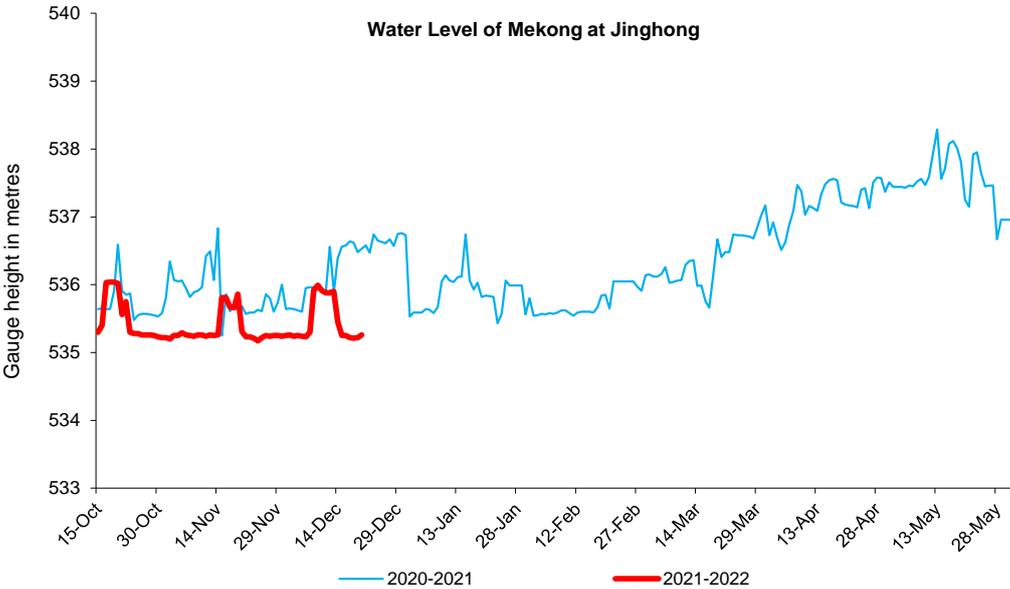


Figure 6: Key stations and model application for River Monitoring and Flood Forecasting.

The MRC’s observed water level at Jinghong showed a decrease of about **0.19 m from 535.45 m on 14 Dec to 535.26 m on 20 Dec 2021 (recorded on 7:00 am)**, and it was about 1.27 m lower than its two-year average (2020-2021) value. The Eyes on Earth (Mekong Dam Monitor) Natural Flow Model indicates that 39% of water is missing at the gauge in Chiang Saen, Thailand and just under 48% of water is missing at Vientiane, Lao PDR. Flow restrictions from dams over the course of the last month are the main driver of missing water throughout the mainstream. The amount of missing water is expected to decrease over the coming month as upstream restrictions end and dams prepare for dry season releases. The outflow was down from 952.15 m<sup>3</sup>/s on 14 Dec to 826.59 m<sup>3</sup>/s on 20 Dec 2021.

[Figure 7](#) below presents water level that increased at the Jinghong hydrological station<sup>1</sup>, indicating the trend of fluctuating water level up to 20 December 2021.



**Figure 7. Water level at the Jinghong hydrological station during 15 Oct to 20 Dec 2021.**

Along with the slightly decreased outflow from Jinghong upstream, water levels of monitoring stations at Chiang Saen in Thailand decreased about 0.54 m from 14 to 20 Dec 2021. However, water levels from Chiang Khan in Thailand to Paksane in Lao PDR slightly increased about 0.25 m from 14 to 20 Dec 2021 due to less rainfall in the area and influence of dam operation. Water levels from Nakhon Phanom in Thailand to Pakse in Lao PDR were decreasing about 0.10 m. Water levels from the stretches of the river from Stung Treng to Kratie and at Kompong Cham in Cambodia, moreover, were decreasing due to less contributed rainfall from the upstream part (at Pakse and 3S area in Viet Nam).

Based on hydrological phenomenon, the contribution of inflow water from the upstream of Lancang-Mekong in China to the Mekong mainstream is about 16% in total during the wet season from June to October and about 25% in total during the dry season from November to May. The whole inflow of water into the LMB is influenced by rainfall at the Mekong mainstream and its tributaries during the wet season.

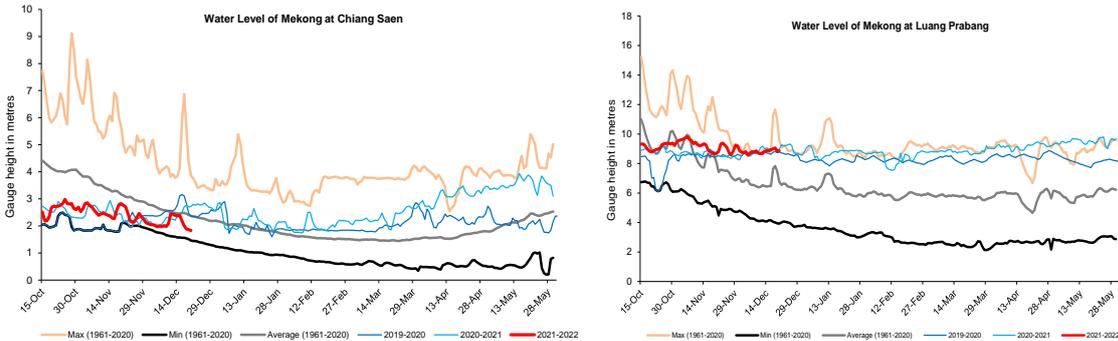
<sup>1</sup> Near-real time data of hydro-meteorological monitoring at the Jinghong hydrological station is available at <https://portal.mrcmekong.org/monitoring/river-monitoring-telemetry>.

### Chiang Saen and Luang Prabang

Water level during December 14-20 at Thailand’s Chiang Saen down from 2.37 m to 1.83 m and stayed about 0.54 m lower than its Long-Term-Average (LTA), which is considered critical. When compared to last week, this week’s water level is relatively higher.

Water level at the Luang Prabang station in Lao PDR slightly decreased from 8.88 m to 8.87 m, during the reporting period. Compared to last week, the figure shows down by about 0.01 m. The water level at this station was 0.71 m lower than its Maximum Value. The water levels at Chiang Saen and Luang Prabang are shown in [Figure 8](#) below.

Being situated between the upstream (Nam Beng, Nam Ou, Nam Suong, and Nam Khan) and downstream (Xayaburi) hydropower dams, the Luang Prabang station has a unique characteristic as it is influenced by the operations of all its surrounding dams. **Thus, the water level at this station can possibly change very rapidly during the early dry season.**



**Figure 8. Water levels at Chiang Saen in Thailand and Luang Prabang in Lao PDR.**

### Chiang Khan, Vientiane-Nong Khai and Paksane

The water level at Chiang Khan in Thailand (downstream of the Xayaburi dam) increased during the reporting week. It showed 0.55 m lower than its LTA. Furthermore, water level downstream at Vientiane in Lao PDR showed increasing from 2.21 m to 2.45 m and was about 0.07 m higher than its LTA during 14-20 December 2021. At Nong Khai station in Thailand, the water level was also up during the reporting period. It increased from 1.57 m to 1.82 m, and still showing 1.07 m lower than its LTA. At Paksane in Lao PDR, water levels increased about 0.02 m, up from 2.44 m to 2.46 m. The WL at this station was still about 1.22 m lower than its LTA. The recently slightly increased water levels were obviously due to inflow from upstream, less rainfall in the sub-catchment area and water released from upstream. The water levels at Vientiane and Paksane are shown in [Figure 9](#) below.

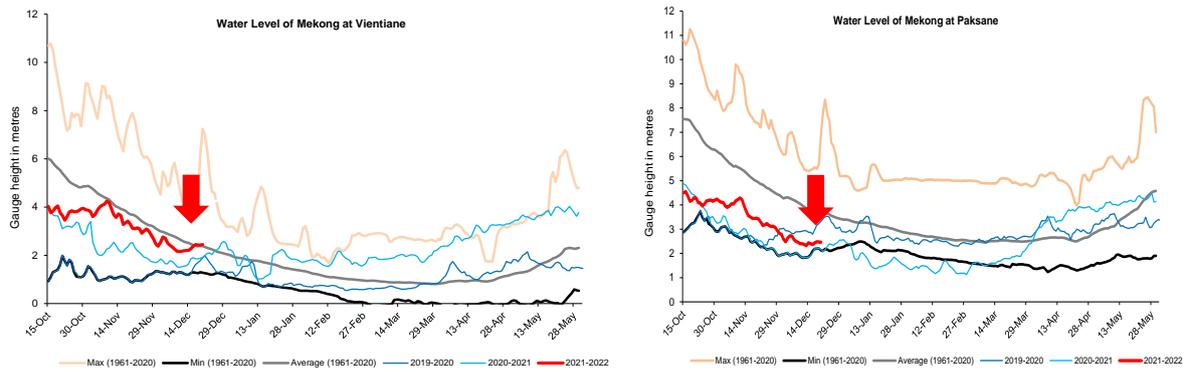


Figure 9. Water levels Veintiane and Paksane in Lao PDR.

### Nakhon Phanom to Pakse

Similarly, water levels from Nakhon Phanom in Thailand to Pakse in Lao PDR increased in between 0.02 m and 0.14 metres, during the reporting period. **Water levels at these stations were staying below their LTA level.** The current WL at Savannakhet in Lao PDR is lower than its historical minimum level, which considered very critical. [Figure 10](#) shows the water levels at Nakhon Phanom and Savannakhet stations.

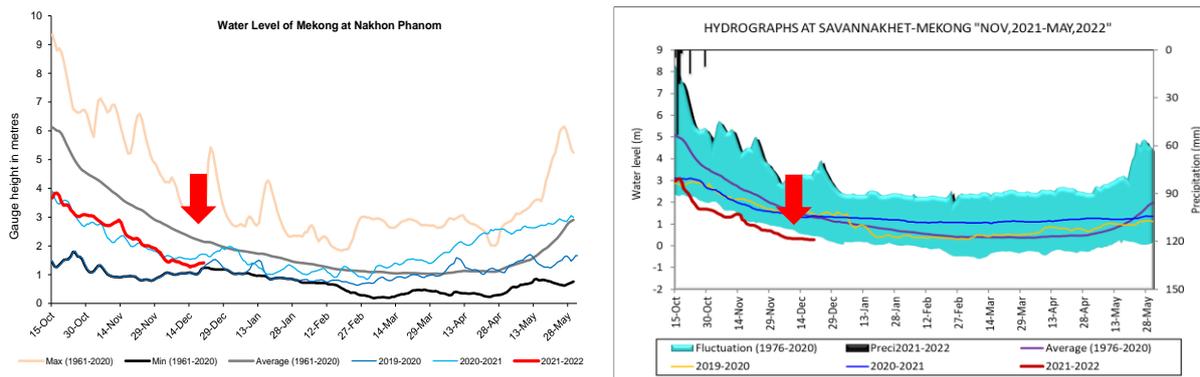
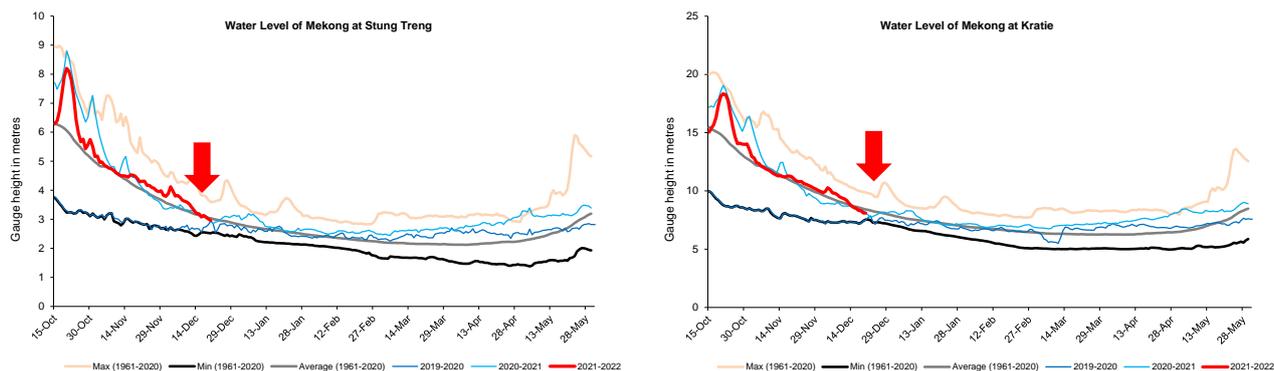


Figure 10: Water levels at Nakhon Phanom and Savannakhet of Thailand and Lao PDR.

### Stung Treng to Kampong Cham/Phnom Penh to Koh Khel/Neak Luong

Following the same trend from the upstream part of the Mekong River and the 3S river (Sekong, Se San, and Sre Pok), the water levels from Stung Treng to Kratie in Cambodia were decreasing during 14-20 December 2021. This week water level from Stung Treng to Kratie decreased about 0.24 m and 0.06 m respectively. Water levels at Stung Treng and Kratie are staying about 0.071 m and 0.31 m lower than their LTA value respectively, while water level at Kompong Cham was about 1.12 m below their LTA (as showed in [Figure 11](#)).

This week, the **Water levels at Stung Treng and Kratie were lower than their LTA, which considered critical.**



**Figure 11: Water levels at Stung Treng and Kratie on the Mekong River.**

At Chaktomuk on the Bassac River, due to less rainfall and contributed flows from upstream catchment, the water level was down by about 0.41 m and stayed 1.40 m lower than its LTA value; while at Koh Khel, water level decreased about 0.30 m, staying 0.81 m lower than its LTA value. The water level at Prek Kdam on the Tonle Sap Lake decreased about 0.34 m and was about 0.82 m lower than its LTA value. The water level at the Tonle Sap Lake (observed at Kompong Luong) was similar to Prek Kdam station's water level. The recently decreased water level was because of no rain and low inflow contributed from upstream of the Tonle Sap Lake area during the reporting period. The water level at the Tonle Sap Lake (observed at Kompong Luong) followed the same trend of Prek Kdam station's water level. **Water levels at these stations were staying below their LTA level, which still considered critical.**

#### Tidal stations at Tan Chau and Chau Doc

Like last week, the water levels from 14 to 20 December 2021 at Viet Nam's Tan Chau and Chau Doc were fluctuating due to daily tidal effects from the sea. The fluctuation levels were between 1.41 m and 1.63 m; they were in between the range of their LTA and historical maximum and minimum levels which **considered normal**.

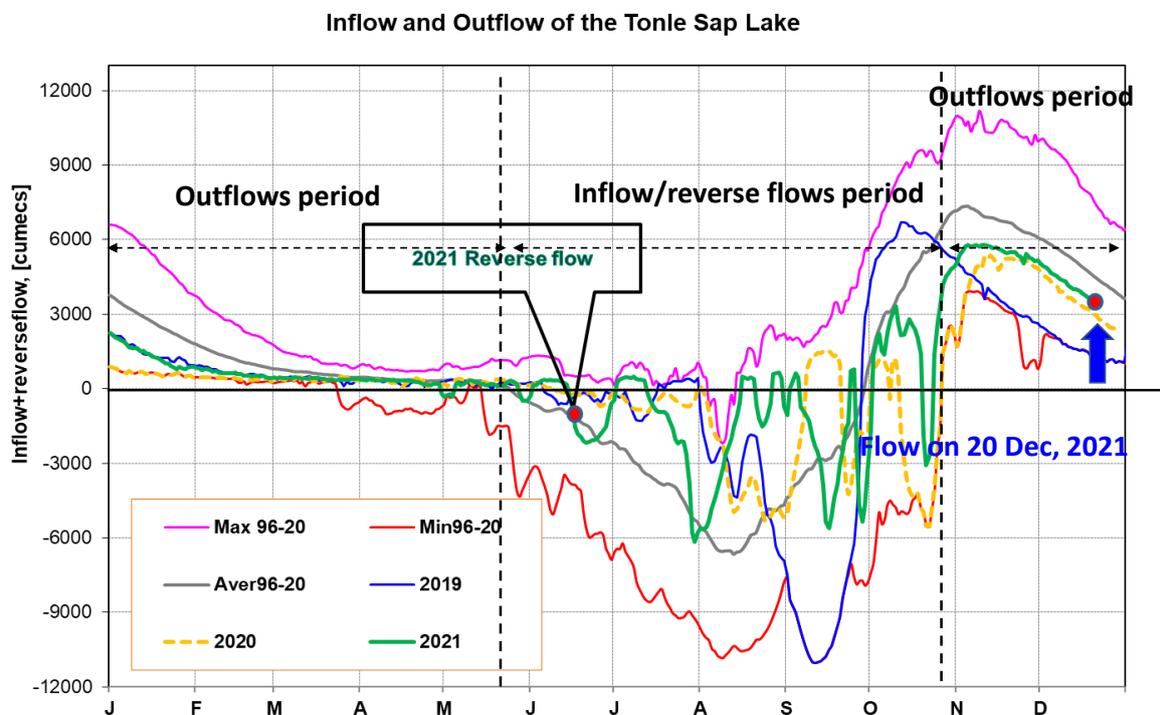
#### The Tonle Sap Flow

At the end of the wet season, when water levels along the Mekong River subside, outflows of the Tonle Sap Lake return into the Mekong River and then to the Delta. This phenomenon normally takes place from end of September to October. Based on flow observation at Prek Kdam, the outflow of the Tonle Sap Lake was taking place since 10 October 2021.

[Figure 12](#) shows the seasonal changes of the inflow/reverse flow and the outflow of the TSL at Prek Kdam in comparison with the flows of 2019 and 2020, and their LTA level (1997-2020). Up to December 20 of this reporting period, **it was observed that the main outflow to Tonle Sap Lake slightly decreased due to less rainfall and inflows from upstream**. This decreased outflow of Tonle Sap Lake was most likely caused by less inflows and rainfall from the catchment area. Up to this date, the outflow from the Tonle Sap Lake condition in 2021 is higher than 2019 and 2020 outflow conditions. For next week, less rainfall is forecasted for the Tonle Sap area; thus, the outflow into the Tonle Sap Lake is likely continuing to decrease from the current level.

[Figure 13](#) shows seasonal changes in monthly flow volumes up to December 20 for the Lake compared with the volumes in 2019, 2020 and their LTA, and the fluctuation levels (1997–2020). It shows that up to December 20, **the water volume of the Tonle Sap Lake was lower than its LTA but higher than 2019 and 2020 during the same period**. The figure is displayed in [Table 1](#), which indicates that the Tonle Sap Lake has been affected by water levels from the Mekong River, the tributaries, and rainfall in the surrounding sub-catchments and ***considered critical***.

This demonstrates the influence of the relationships between the reverse flows, water levels of the Mekong River, inflows from tributaries, and the flow direction in the complex hydraulic environment of the Tonle Sap Lake during the wet and dry seasons. The data show that about half of the annual inflow volume into the Tonle Sap Lake has originated from the Mekong mainstream. Thus, flow alterations in the mainstream could have direct impact on the Tonle Sap Lake water levels and on its hydrology.



**Figure 12: Seasonal change of inflows and outflows of Tonle Sap Lake.**

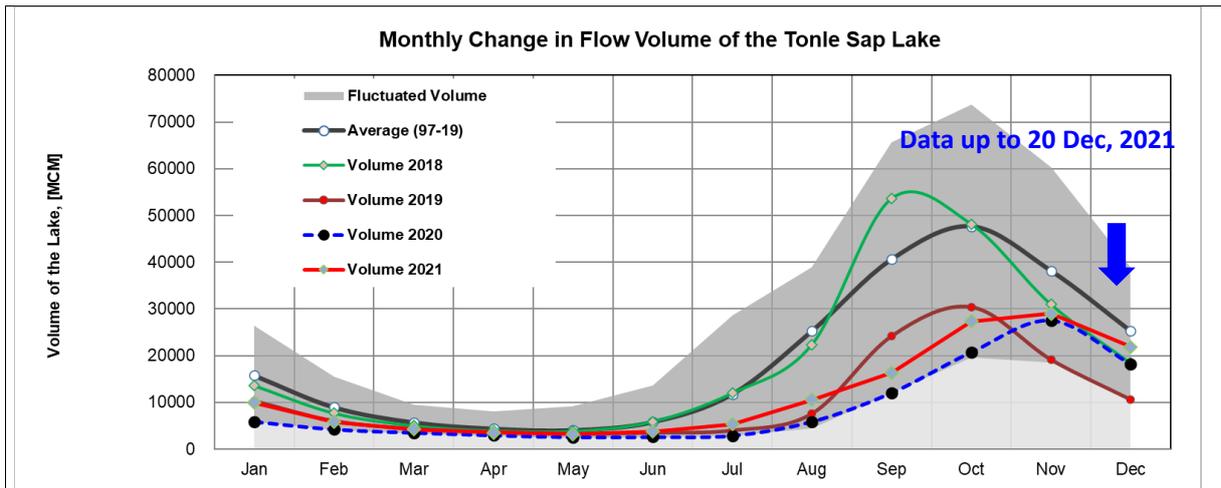


Figure 13. The seasonal change in monthly flow volume of Tonle Sap Lake.

Table 1. The monthly change in the flow volume of Tonle Sap Lake.

Month	Average Volume (97-19) [MCM]	Max Volume [MCM]	Min Volume [MCM]	Volume 2018 [MCM]	Volume 2019 [MCM]	Volume 2020 [MCM]	Volume 2021 [MCM]
Jan	15756.54	26357.53	5906.80	13633.41	10285.31	5906.80	9923.80
Feb	8964.81	15596.22	4198.60	7729.72	6019.30	4264.19	5832.97
Mar	5711.41	9438.24	3347.07	5037.06	4354.62	3553.99	4264.88
Apr	4379.57	8009.14	2866.91	3956.47	3667.47	2992.61	3556.68
May	4063.12	9176.93	2417.81	3864.00	3266.43	2594.92	3240.78
Jun	5787.88	13635.01	2468.70	5919.18	3517.06	2641.88	3798.29
Jul	11749.36	28599.56	2925.86	12024.96	4001.99	2925.86	5346.73
Aug	25254.98	39015.12	4433.46	22399.65	7622.71	5941.07	10547.80
Sep	40602.85	65632.35	12105.31	53639.54	24194.19	12105.31	16382.34
Oct	47688.24	73757.23	19705.50	48193.08	30358.38	20799.13	27318.21
Nov	38191.50	60367.33	18534.61	31036.07	19112.65	27546.80	28982.93
Dec	25332.58	38888.95	10563.49	18469.21	10577.29	18251.65	21855.96
	Critical situation, compared with historical Min values						
	Normal condition, compared with LTA (Long term average)						
	Low volume situation, compared with LTA values						
Unit: Million Cubic Meter (1 MCM= 0.001 Km <sup>3</sup> )							

## 4 Flash Flood in the Lower Mekong Basin

During December 14-20, the LMB was affected by three main weather factors. These include (i) The rather active high pressure covered upper part of the LMB during the beginning of the week then it weakened. These conditions caused cold weather in some areas in those parts; (ii) the active northeast monsoon prevailed over the Gulf of Thailand during the week; and (iii) circulation of the typhoon “Rai” moved over middle of the sea and headed north-westwards during the weekend, however this circulation did not directly affect to the LMB.

According to the MRC-Flash Flood Guidance System (MRC-FFGS) and analysis, flash flood events were not detected during the reporting period in over the LMB.

## 5 Drought Monitoring in the Lower Mekong Basin

### Weekly drought monitoring from 11 to 17 December 2021

Drought monitoring data for 2021 are available from Saturday to Friday every week; thus, the reporting period is normally delayed by three days compared to Flood and Flash Flood reports. We adopt the Index of Soil Water Fraction (ISWF) data obtained from FFGS to represent soil moisture of agricultural indicator for both dry and wet seasons.

- **Weekly Standardised Precipitation Index (SPI1)**

Meteorological drought condition of the LMB from December 11 to 17, as shown in [Figure 11](#), was normal in most parts of the region. Weekly SPI map shows that the LMB received average rainfall in most parts of the region.

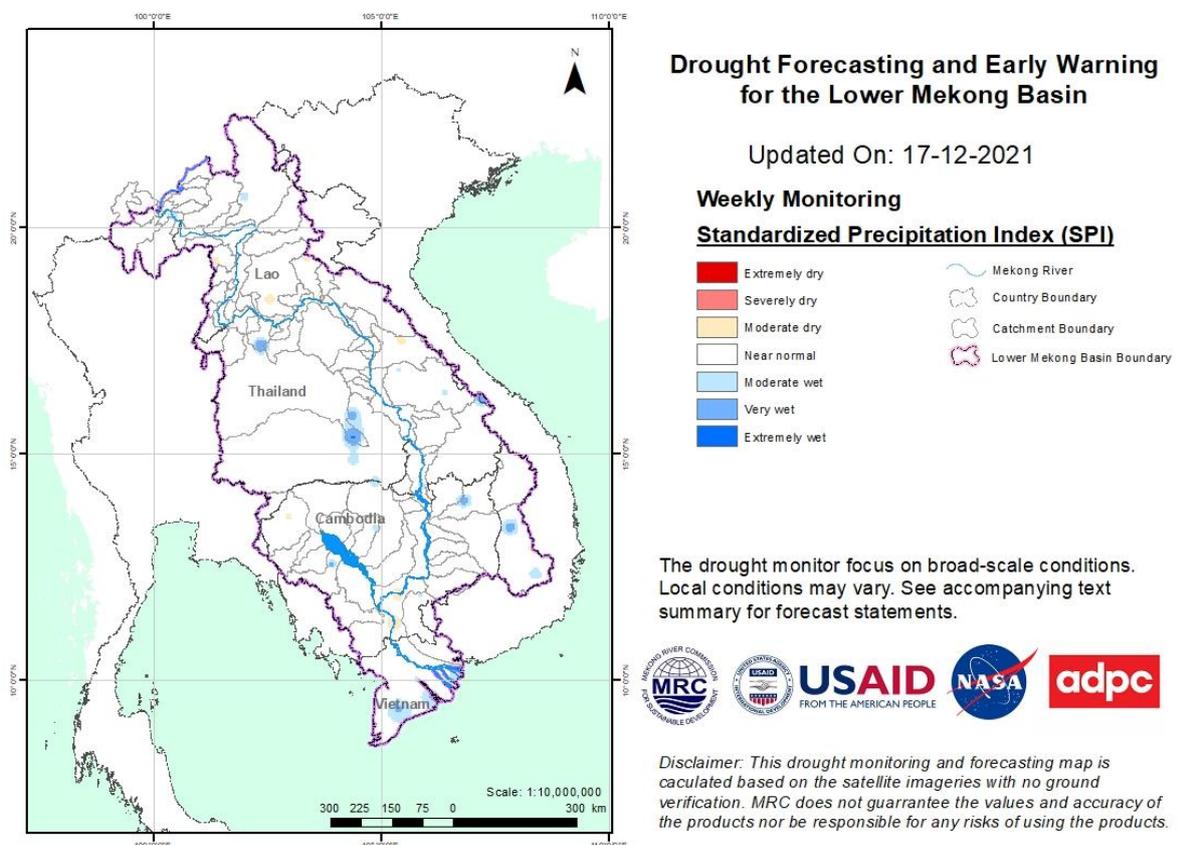
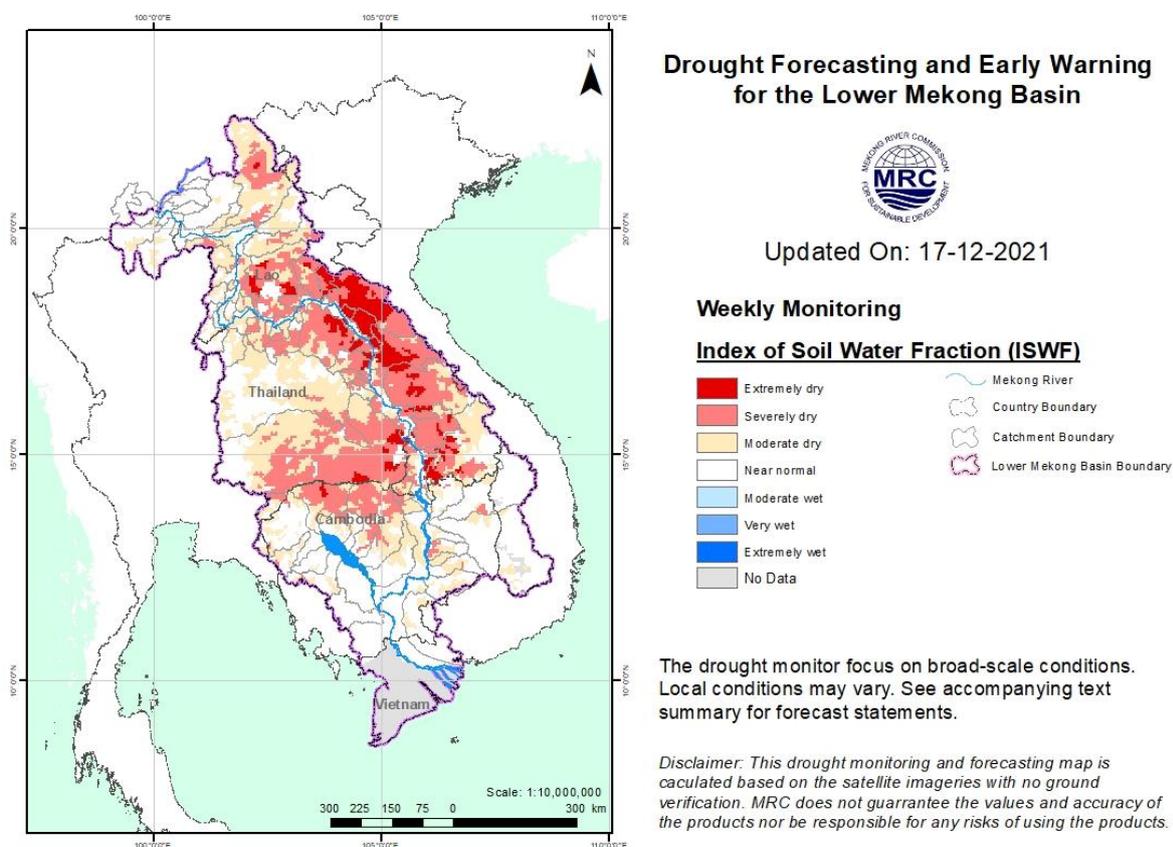


Figure 14: Weekly standardised precipitation index from Dec 11 to 17.

- **Weekly Index of Soil Water Fraction (ISWF)**

With much less rainfall in the northern and middle parts of the region, soil moisture conditions from Dec 11 to 17, as displayed in [Figure 12](#), were severely and extremely dry in most areas of the LMB especially the north and middle part.

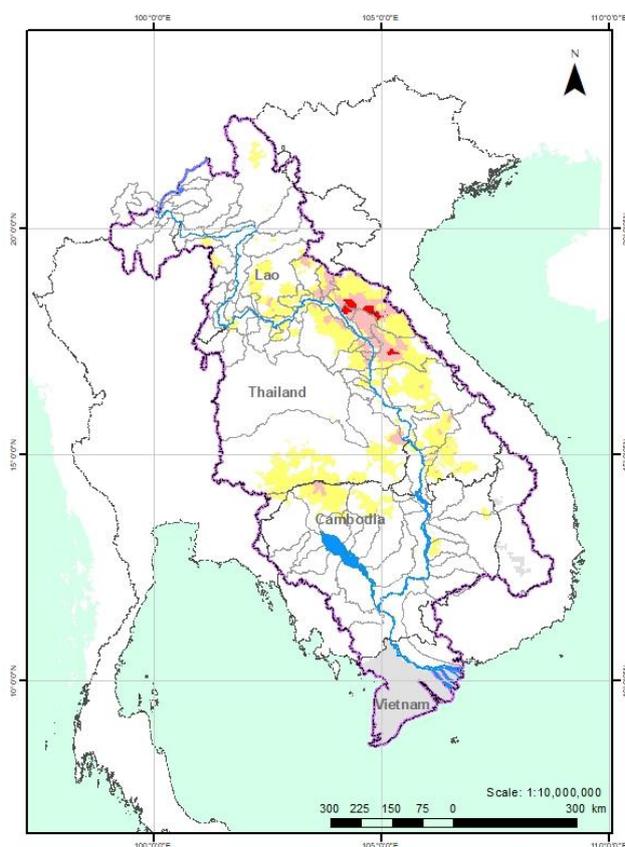
**Note:** The index of soil water fraction presents the current soil water fraction conditions compared with normal month; therefore, it normally shows extremely dry during dry season which is completely different from SPI that is standardized to its specific month of the years. However, this does not mean that the areas are threatened by agricultural drought as generally during transition period of wet and dry seasons and dry season only the irrigated areas are used for agricultural plantation.



**Figure 15: Weekly Index of Soil Water Fraction from Dec 11 to 17.**

- **Weekly Combined Drought Index (CDI)**

The combined drought indicator, as displayed in [Figure 13](#), reveals that during Dec 11 to 17 the LMB was facing some moderate and severe droughts mainly in the northeast of the LMB covering Phongsaly, Xayaburi, Vientiane, Xaysomboun, Xiengkhuang, Borikhamxay, Khammuane, Nong Khai, Nakhon Phanom, Sakon Nakhon, and Savannakhet due to severely dry soil moisture as described above. The other areas, however, were normal during the reporting week. No serious drought risk was detected during the reporting week.



## Drought Forecasting and Early Warning for the Lower Mekong Basin



Updated On: 17-12-2021

### Weekly Monitoring

#### Combined Drought Index (CDI)

	D4 (Exceptional Drought)		Mekong River
	D3 (Extremely Drought)		Country Boundary
	D2 (Severely Drought)		Catchment Boundary
	D1 (Moderate Drought)		Lower Mekong Basin Boundary
	D0 (Normal Condition)		
	No Data		

The drought monitor focus on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

*Disclaimer: This drought monitoring and forecasting map is calculated based on the satellite imageries with no ground verification. MRC does not guarantee the values and accuracy of the products nor be responsible for any risks of using the products.*

**Figure 16: Weekly Combined Drought Index during Dec 11 to 17.**

More information on Drought Forecasting and Early Warning (DFEW) as well as the explanation is available here: <http://droughtforecast.mrcmekong.org/templates/view/our-product>. DFEW provides not only weekly monitoring and forecasting information but also a three-month forecast of drought indicators with seasonal outlook which are updated every month based on international weather forecast models. Details on drought forecast are described in section [6.4](#) of this report.

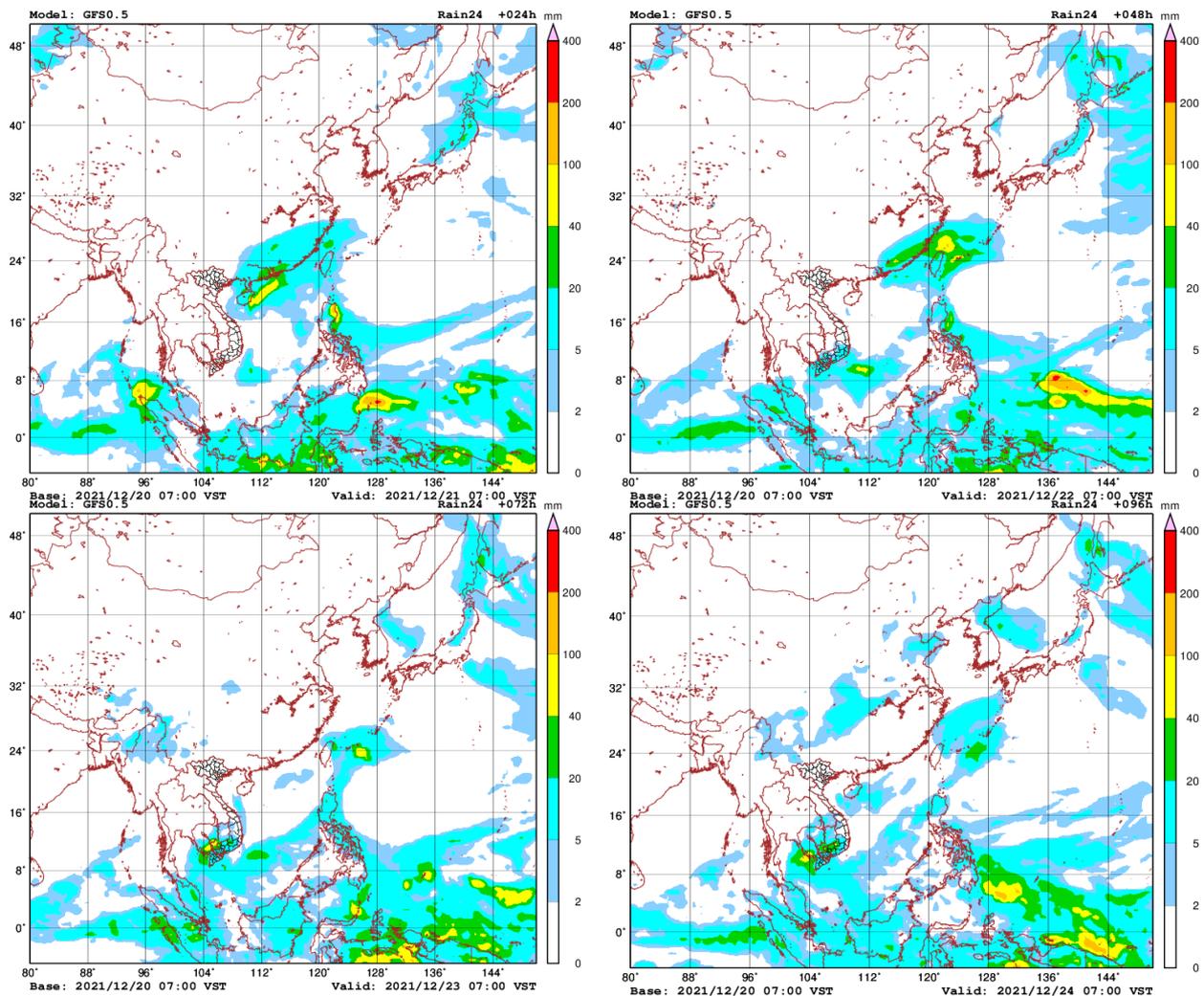
## 6 Weather and Water Level Forecast and Flash Flood Information

### 6.1 Weather and rainfall forecast

Based on the analysis of the synoptic meteorological information and result from the Global Forecast System (GFS) Model, in the coming week, two main factors might affect the LMB. They include (i) High pressure from China in the upper part and (ii) the on-going prevailing Southwest Monsoon from the Gulf of Thailand to the lower part of the LMB.

During December 21-27, small rainfall (5-20 mm/24h) or no rain may occur in some areas of the LMB.

[Figure 14](#) shows accumulated rainfall forecast (24hrs) of the GFS model during December 21-27.



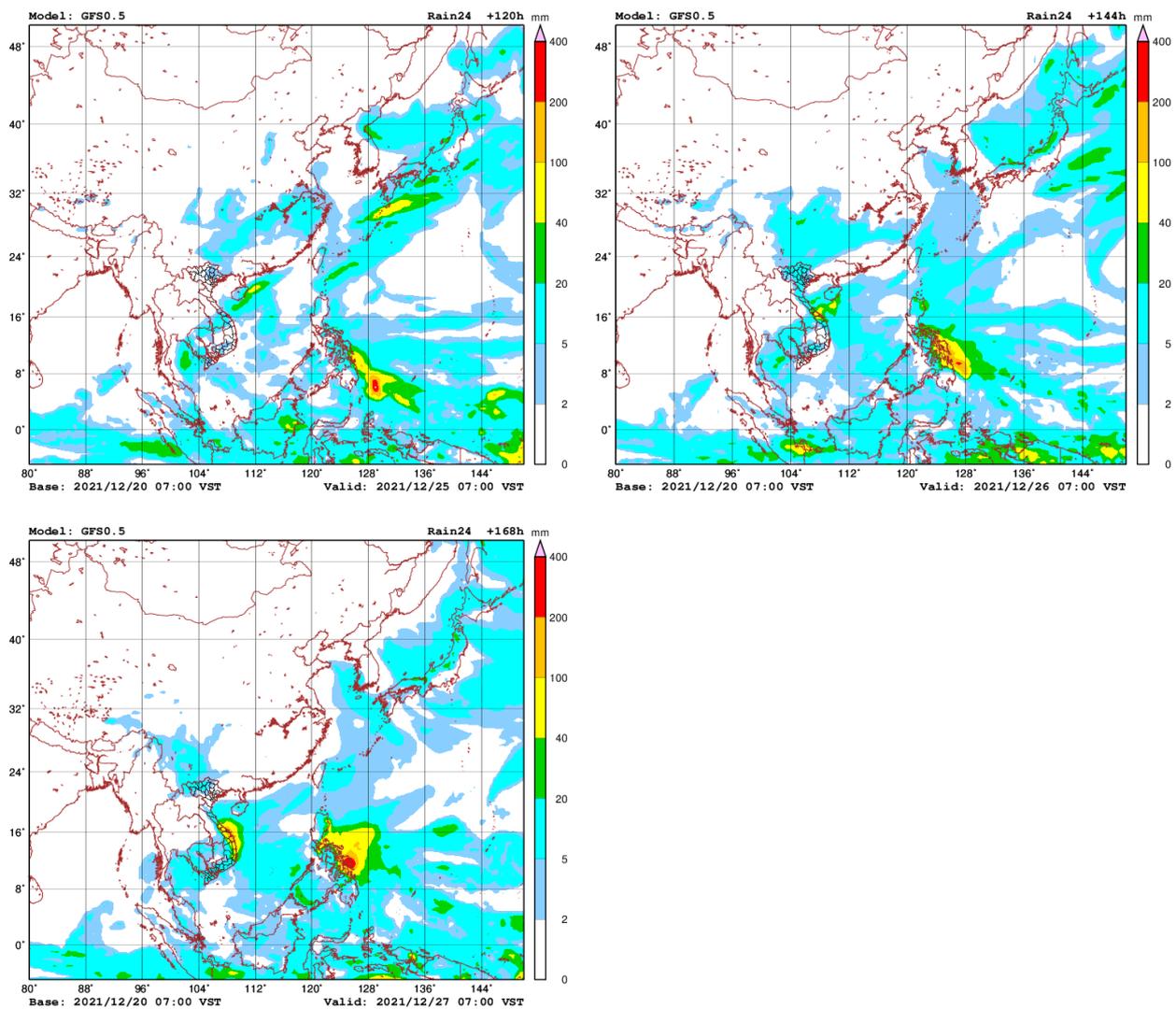


Figure 17: Accumulated rainfall forecast (24 hrs) of model GFS.

## 6.2 Water level forecast

### Chiang Saen and Luang Prabang

Based on December 20's weekly river monitoring bulletin, the weekly forecast water level at Chiang Saen in Thailand is expected to slightly increase from 1.83 m to 2.07 m in the next seven days. Even so, the trend of water levels at these stations will continue staying below their LTA.

For Luang Prabang in Lao PDR, the water level is likely to increase, staying between 8.87 m and 9.17 m during the same period. The current water levels are lower than its maximum value.

### **Chiang Khan, Vientiane-Nong Khai and Paksane**

Water level at Chiang Khan station in Thailand is forecasted to be up about 0.15 m for the next seven days. Also, from Vientiane in Lao PDR and Nong Khai in Thailand will increase of about 0.10 m in the next seven days. At Paksane in Lao PDR, water level will increase about 0.05 m due to less inflow from the upper catchments. Below average rainfall is forecasted in the area. The water levels here will remain lower than their LTA.

### **Nakhon Phanom to Pakse**

Water levels from Nakhon Phanom in Thailand and Savannakhet in Lao PDR will slightly decrease by about 0.05 m in the next seven days. From Khong Chiam in Thailand to Pakse in Lao PDR the water level will go down by about 0.5 m. Water level at these stations will stay lower than their LTA level. Next week low-average quantity of precipitation is forecasted in the area.

### **Stung Treng to Kampong Cham/Phnom Penh to Koh Khel/Neak Luong**

From Stung Treng to Kampong Cham along the Mekong River in Cambodia, the water levels will go down between 0.04 m and 0.25 m over the next seven days. Low-average rainfall is forecasted for the area between Stung Treng and Kampong Cham during next week.

The water levels of the Tonle Sap Lake at Prek Kdam and Phnom Penh Port as well as at Phnom Penh's Chaktomuk on the Bassac River will decrease about 0.25 m over the next seven days.

Water levels at most of the stations will continue to stay lower than their LTA value, particularly in the lower part of the region from the Bassac at Phnom Penh to Koh Khel as well as from Tonle Sap at Prek Kdam to Phnom Penh Port, including the Tonle Sap Lake. Precipitation is forecasted for the low-lying area of Cambodia next week.

### **Tidal stations at Tan Chau and Chau Doc**

For Viet Nam's Tan Chau on the Mekong River and Chau Doc on the Bassac River, water levels will be moving up and down with their LTA, following daily tidal effects from the sea.

[Table 3](#) shows the weekly River Monitoring Bulletin issued on December 20. Results of the started weekly river monitoring bulletin are also available at [http://ffw.mrcmekong.org/bulletin\\_wet.php](http://ffw.mrcmekong.org/bulletin_wet.php).

### **6.3 Flash Flood Information**

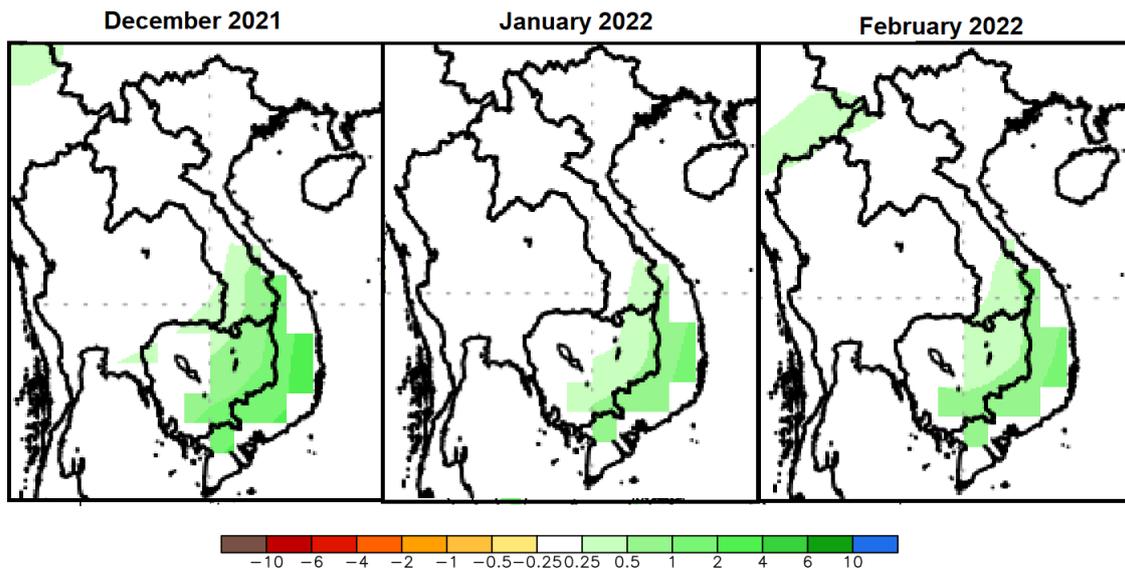
Flash flood events are not likely to happen in the LMB. However, local heavy rain in a short period of time might still be possible with unexpected short flash floods. During the dry season if extreme weather occurs, the information on flash flood guidance for the next one, three, and six hours is updated at <http://ffw.mrcmekong.org/ffg.php>.

Further detailed information on Flash Flood Information Warning, as well as on its explanation, is available for download [here](#).

## 6.4 Drought forecast

There are several climate-prediction models with different scenarios on the upcoming months until November 2021. The MRC's DFEWS adopts an ensemble model called the North America Multi-Model Ensemble (NMME), which averages all scenarios.

The global scale of rainfall prediction is used to see how the rain distribution looks like for the coming months. [Figure 15](#) shows the ensemble mean of daily average precipitation (mm/day) each month from November 2021 to January 2022 produced by the NMME.



**Figure 185. Daily average of monthly rainfall anomaly forecast from December 2021 to February 2022.**

The ensemble prediction model based on the initial conditions in November reveals that the LMB is likely to receive from average to above average rainfall from December 2021 to January 2022. There will be some more rain dropping over the southern part of the LMB during December 2021-February 2022 making the condition cooler than normal year, while normal condition is likely taking place in the upper and middle parts of the region during the last month of the year.

The 2021 dry season is relatively wetter than that of 2020 and the monsoon rain in the 2021 wet season has arrived earlier than it did in 2019 and 2020 especially over the upper and central parts of the LMB.

Table 2. Weekly River Monitoring Bulletin.



## Mekong Bulletin

Mekong River Commission Secretariat (MRCS)

Regional Flood and Drought Management Centre (RFDMC)

P.O. Box 623 #576, National Road #2, Chak Angre Krom, Meanchey, Phnom Penh, Cambodia

Tel: (855-23) 425353, Fax: (855-23) 425363, Email: floodforecast@mrcmekong.org

Forecast period from: 21 December to 27 December 2021

Date: 20 December 2021

LOCATION	Country	Observed Rainfall (mm)	Zero gauge above M.S.L (m)	Min water level against zero gauge (m)	Observed W. level against zero gauge (m)		Forecasted Water Levels (m)							
					19-Dec	20-Dec	21-Dec	22-Dec	23-Dec	24-Dec	25-Dec	26-Dec	27-Dec	
Jinhong		0.0	-	-	535.22	535.26								
Chiang Saen		0.0	357.110	0.00	1.86	1.83	1.82	1.85	1.90	1.95	1.99	2.04	2.07	
Luang Prabang		0.0	267.195	2.53	8.84	8.87	8.90	8.93	8.97	9.02	9.08	9.13	9.17	
Chiang Khan		0.0	194.118	1.91	4.91	4.84	4.82	4.84	4.86	4.88	4.91	4.94	4.98	
Vientiane		0.0	158.040	-0.28	2.43	2.45	2.39	2.37	2.40	2.43	2.45	2.48	2.51	
Nongkhai		0.0	153.648	0.33	1.80	1.82	1.76	1.73	1.76	1.79	1.82	1.85	1.90	
Paksane		0.0	142.125	0.10	2.47	2.46	2.48	2.44	2.42	2.43	2.44	2.46	2.48	
Nakhon Phanom		0.0	130.961	0.18	1.40	1.41	1.42	1.45	1.40	1.38	1.38	1.39	1.41	
Thakhek		0.0	129.629	1.38	2.66	2.66	2.68	2.72	2.66	2.63	2.64	2.66	2.68	
Mukdahan		0.0	124.219	0.72	1.88	1.88	1.88	1.89	1.91	1.86	1.83	1.84	1.86	
Savannakhet		0.0	125.410	-0.65	0.28	0.28	0.28	0.29	0.30	0.27	0.25	0.25	0.27	
Khong Chiam		0.0	89.030	1.02	2.28	2.31	2.33	2.32	2.35	2.39	2.30	2.25	2.27	
Pakse		0.0	86.490	0.03	1.30	1.30	1.31	1.30	1.32	1.35	1.30	1.27	1.29	
Stung Treng		nr	36.790	0.32	3.01	2.96	2.94	2.93	2.92	2.93	2.95	2.91	2.89	
Kratie		nr	-1.080	3.06	8.10	8.10	8.03	7.99	7.95	7.91	7.93	7.96	7.90	
Kompong Cham		nr	-0.930	0.65	4.08	4.03	3.97	3.90	3.84	3.79	3.73	3.75	3.79	
Phnom Penh (Bassac)		-	-1.020	1.58	3.34	3.22	3.17	3.13	3.10	3.06	3.02	3.03	3.05	
Phnom Penh Port		-	0.000	0.14	2.36	2.23	2.17	2.13	2.10	2.06	2.02	2.01	2.03	
Koh Khel		nr	-1.000	1.52	3.24	3.20	3.18	3.15	3.12	3.08	3.05	3.04	3.05	
Neak Luong		nr	-0.330	0.81	2.54	2.44	2.41	2.37	2.33	2.29	2.25	2.22	2.22	
Prek Kdam		nr	0.080	0.58	3.26	3.22	3.18	3.13	3.09	3.05	3.00	2.96	2.95	
Tan Chau		0.0	0.000	-0.37	1.57	1.41	1.22	1.11	1.02	1.00	0.95	0.91	0.88	
Chau Doc		nr	0.000	-0.60	1.76	1.60	1.41	1.28	1.17	1.12	1.05	1.00	0.96	

**REMARKS:**

-: not available.  
 \*: reference stations without forecast.  
 nr: no rain.

River Flood Forecaster

KHEM Sothea

NOTE: Discharge at Luang Prabang may be influenced by hydropower operations (at both upstream and downstream).  
 For more info, please refer to this link:  
<http://www.mrcmekong.org/>; [http://ffw.mrcmekong.org/bulletin\\_wet.php](http://ffw.mrcmekong.org/bulletin_wet.php); <http://ffw.mrcmekong.org/reportflood.php>

## 7 Summary and Possible Implications

### 7.1 Rainfall and its forecast

This week, low rainfall observed over the lower part of the Mekong region at Tan Chau and Chau Doc, varied from 2.20 mm to 13.00 mm. No rainfall in the upper and middle parts of the Mekong region were recorded during this week report. Compared with last week's amount, the rainfall this week was considered lower in the Mekong region.

Based on the forecasted rainfall from satellite using GFS data, rainfall is likely to take place in the areas from the lower part of Cambodia, the 3S area and Mekong Delta in Viet Nam during December 21-27, varying from 0.05 mm to 50 mm. This indicates the starting of dry season over the LMB.

### 7.2 Water level and its forecast

The MRC's observed water level at Jinghong showed a decrease of about **0.19 m from 535.45 m on 14 Dec to 535.26 m on 20 Dec 2021 (recorded on 7:00 am)**, and it was about 1.27 m lower than its two-year average (2020-2021) value. The outflow was down from 952.15 m<sup>3</sup>/s on 14 Dec to 826.59 m<sup>3</sup>/s on 20 Dec 2021.

Water levels in the lower part of the monitoring locations in the LMB during this reporting week were decreasing from Chiang Khan in Thailand to Pakse in Lao PDR. Also, at Stung Treng, Kratie and Kampong Cham in Cambodia, after the end of the heavy rainfall in November water levels dropped significantly, lower than their LTA level. Water levels at Neak Luong, Bassac at Phnom Penh, and Prek Kdam in Cambodia were also lower than their LTA level. The low level was due to low inflows from upstream and no rainfall in the region from 14 to 20 December. Generally, this week's water levels were relatively lower than those of last week from the upper to the lower part of the LMB.

The flow volume of the Tonle Sap Lake is lower than its LTA. From next week, the flow is expected to continue decreasing due to less rainfall forecasted in the inflow catchments of the Tonle Sap Lake.

From Stung Treng to Kampong Cham, the water levels will continue to go down. The water levels – at Neak Luong on the Mekong River, from Prek Kdam to Phnom Penh Port on the Tonle Sap, and from Chaktomuk to Koh Khel on the Bassac – are forecasted to continue staying below their LTA.

The situation in Tan Chau on the Mekong River and Chau Doc on the Bassac River is expected to remain unchanged.

Since the fourth week of October 2021, water levels across most monitoring stations in the LMB have significantly dropped to the level lower than their LTA (from upper to lower stretches within the LMB). For a more complete preliminary analysis of the hydrological

conditions in the LMB over July–December 2020, November 2020 to May 2021 and June to October 2021 see this [Situation Report](#).

The contribution to the Mekong River’s flow from the UMB in China (Yunnan component) is about 16% by the time the river discharges through the Mekong Delta into the Sea. By far the major contribution comes from the two major ‘left-bank’ (Eastern) tributaries between Vientiane – Nakhon Phanom and Pakse – Stung Treng, which together contribute more than 40% of the flows.

### **7.3 Flash flood and its trends**

With the predicted of rainfall for the coming week as mentioned earlier in [section 6.1](#), major flash floods are not likely to happen in the LMB.

### **7.4 Drought condition and its forecast**

Drought condition of the LMB from December 11 to 17 was normal all over the LMB except some moderate drought in northeastern part due to severely dry soil moistures during the beginning of dry season. The region showed no significant threat except some moderate and severe dry soil moistures in the upper and middle parts of the LMB.

For the upcoming three-month forecast, the LMB is likely to receive from average to above average rainfall from December 2021 to February 2022. There will be some more rain dropping over the southern part of the LMB during December 2021-February 2022 making the condition cooler than normal year, while normal condition is likely taking place in the upper and middle parts of the region during the last month of the year.

**Annex A: Tables for weekly updated water levels and rainfall at the Key Stations**

Table A1: Weekly observed water levels

2021	Jinghong	Chiang Saen	Luang Prabang	Chiang Khan	Vientiane	Nongkhai	Paksane	Nakhon Phanom	Mukdahan	Pakse	Stung Treng	Kratie	Kompong Cham	Phnom Penh (Bassac)	Koh Kheh	Neak Luong	Prek Kdam	Tan Chau	Chau Doc
14-12-2021	535.45	2.37	8.88	4.73	2.21	1.57	2.44	1.27	1.79	1.40	3.20	8.70	4.50	3.63	3.50	3.02	3.56	1.60	1.63
15-12-2021	535.25	2.39	8.87	4.88	2.28	1.60	2.40	1.30	1.79	1.36	3.19	8.57	4.39	3.49	3.35	2.90	3.46	1.55	1.62
16-12-2021	535.25	2.19	8.94	4.92	2.38	1.71	2.37	1.31	1.83	1.30	3.08	8.50	4.27	3.42	3.29	2.78	3.38	1.58	1.68
17-12-2021	535.22	2.01	8.98	4.89	2.45	1.82	2.44	1.35	1.83	1.30	3.13	8.32	4.23	3.41	3.28	2.73	3.36	1.64	1.72
18-12-2021	535.21	1.89	9.05	4.88	2.43	1.86	2.48	1.39	1.86	1.33	3.07	8.32	4.10	3.37	3.24	2.66	3.29	1.60	1.75
19-12-2021	535.22	1.86	8.84	4.91	2.43	1.80	2.47	1.40	1.88	1.30	3.01	8.10	4.08	3.34	3.24	2.54	3.26	1.57	1.76
20-12-2021	535.26	1.83	8.87	4.84	2.45	1.82	2.46	1.41	1.88	1.30	2.96	8.10	4.03	3.22	3.20	2.44	3.22	1.41	1.60

Table A2: Weekly observed rainfall

2021	Jinghong	Chiang Saen	Luang Prabang	Chiang Khan	Vientiane	Nongkhai	Paksane	Nakhon Phanom	Mukdahan	Pakse	Stung Treng	Kratie	Kompong Cham	Phnom Penh (Bassac)	Koh Kheh	Neak Luong	Prek Kdam	Tan Chau	Chau Doc
14-12-2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-12-2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16-12-2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17-12-2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.2	13
18-12-2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-12-2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-12-2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



## Mekong River Commission Secretariat

P. O. Box 6101, 184 Fa Ngoum Road, Unit 18 Ban Sithane Neua, Sikhottabong District, Vientiane 01000, Lao PDR  
Tel: +856 21 263 263. Fax: +856 21 263 264 [www.mrcmekong.org](http://www.mrcmekong.org)

© Mekong River Commission 2020